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Combs et al.

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(54) **FIRE FIGHTING MONITOR**

(75) Inventors: **Eric Nathaniel Combs**, Goshen, IN (US); **Don E. Sjolin**, Granger, IN (US); **Todd Brian Lozier**, Elkhart, IN (US)

(73) Assignee: **Elkhart Brass Manufacturing Company, Inc.**, Elkhart, IN (US)

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A62C 31/28 (2006.01)

(52) **U.S. Cl.**
CPC ***A62C 31/28*** (2013.01)

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CPC A62C 25/00; A62C 31/28
USPC 169/52, 46, 47, 51, 24, 25, 62, 67, 70
See application file for complete search history.

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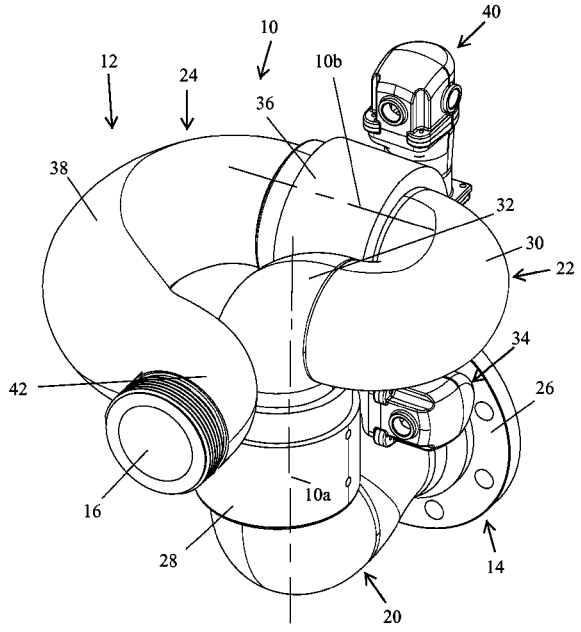
Primary Examiner — Ryan Reis
Assistant Examiner — Chee-Chong Lee
(74) *Attorney, Agent, or Firm* — Faegre Baker Daniels LLP

(57) **ABSTRACT**

A fire-fighting monitor includes a body that has a fluid passageway and an inlet and an outlet. The inlet is adapted to mount to a base on a fire truck, and the body is configured so that the outlet is rotatable about a vertical axis over a 360 degree range of motion. In addition, the body is configured such that the outlet is rotatable about a horizontal axis over one range of motion of about 195 degrees in one form and about 270 degrees in another form.

7 Claims, 11 Drawing Sheets



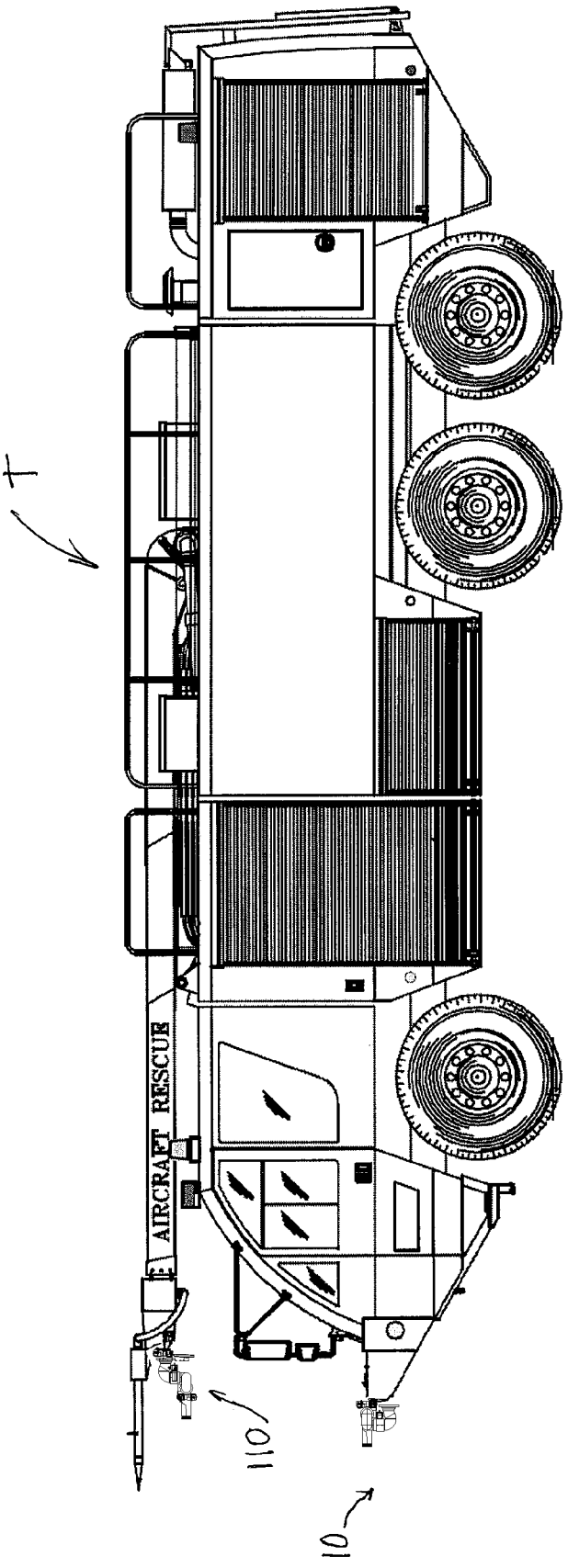


FIG. 1

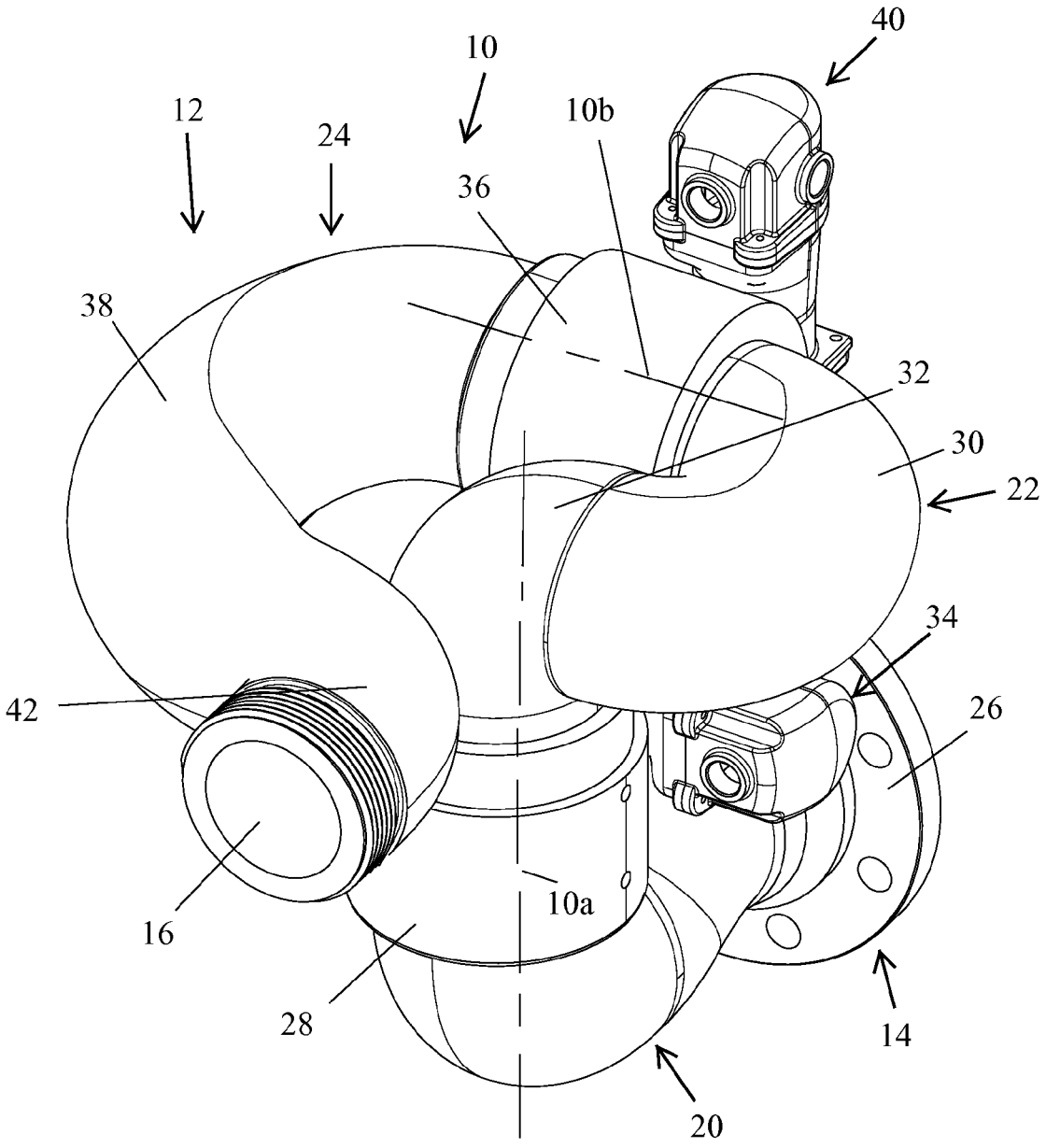


FIG. 2

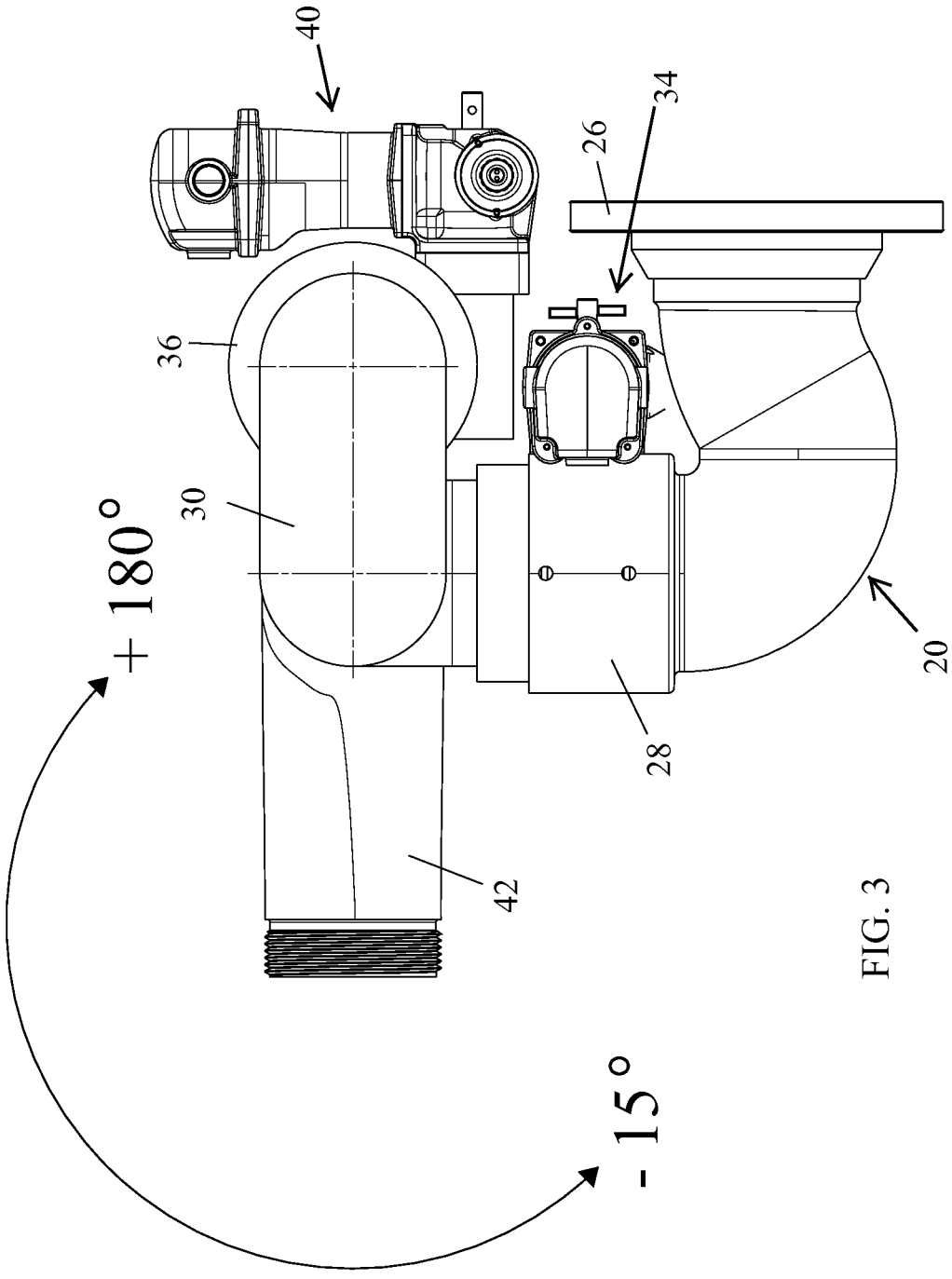


FIG. 3

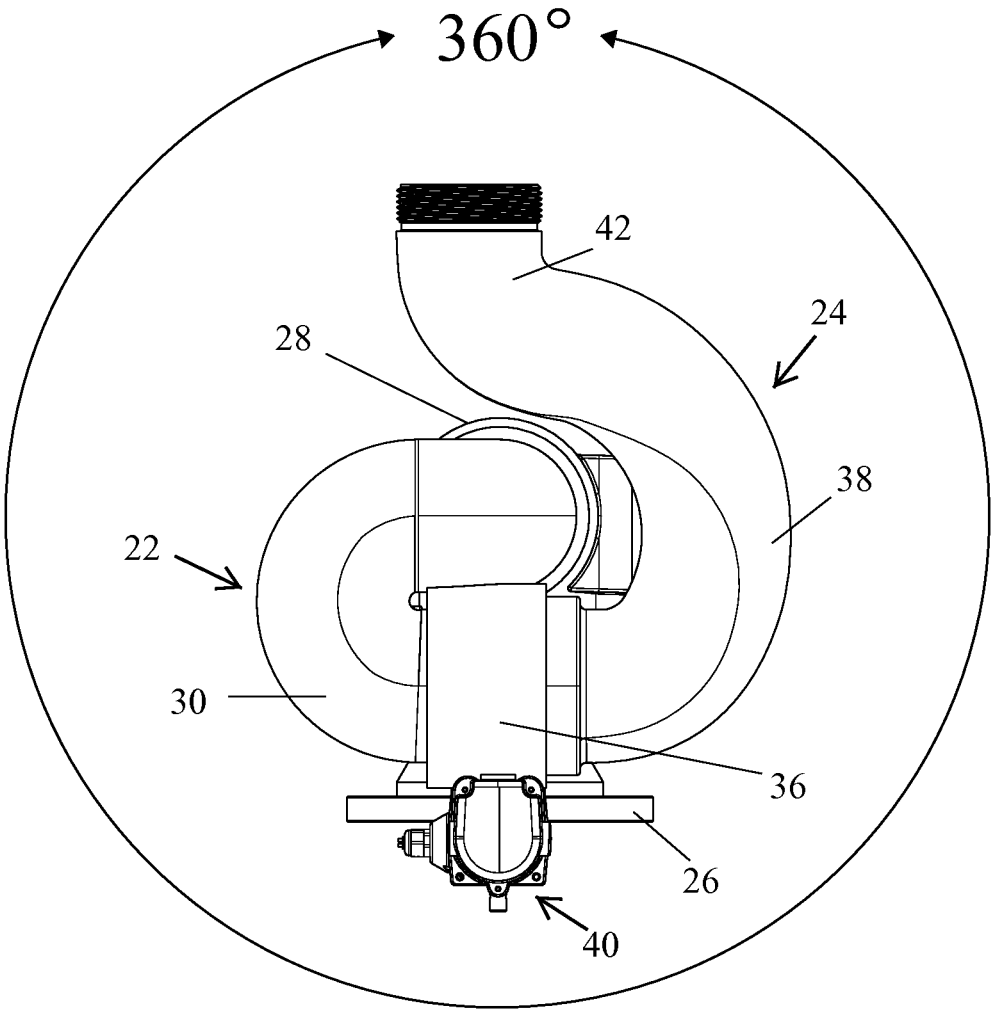


FIG. 4

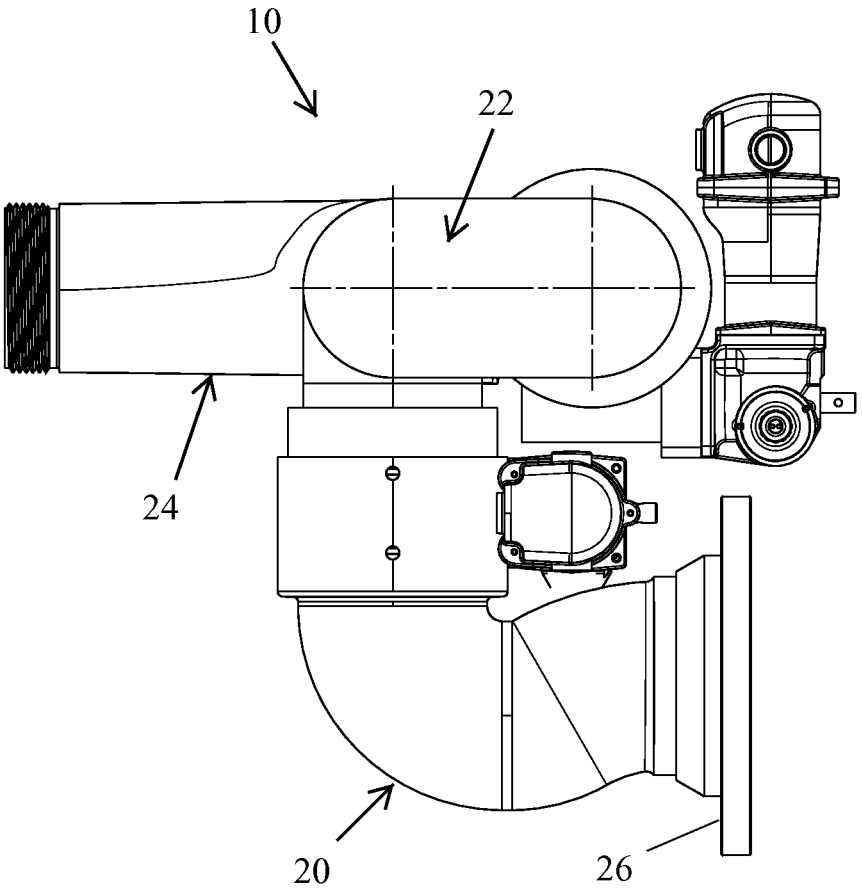


FIG. 5

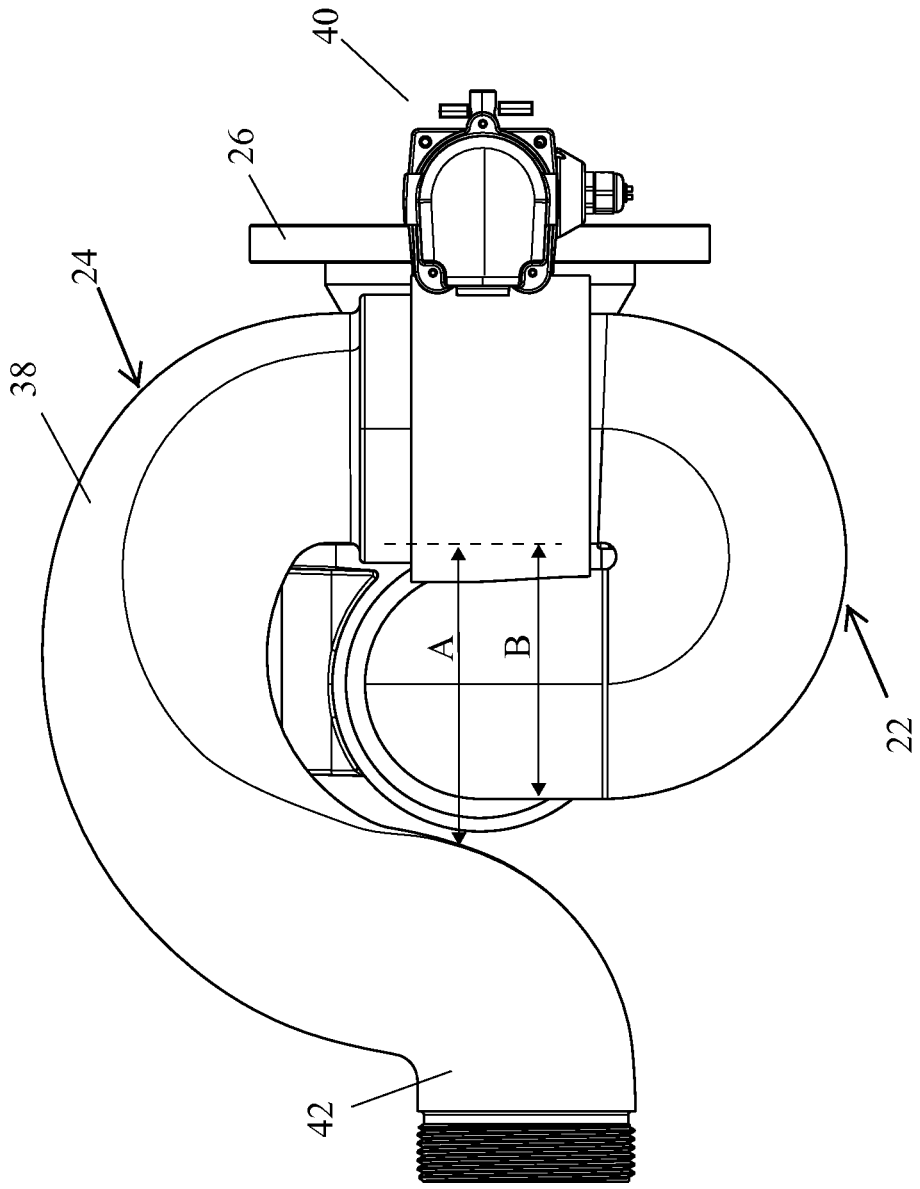


FIG. 6

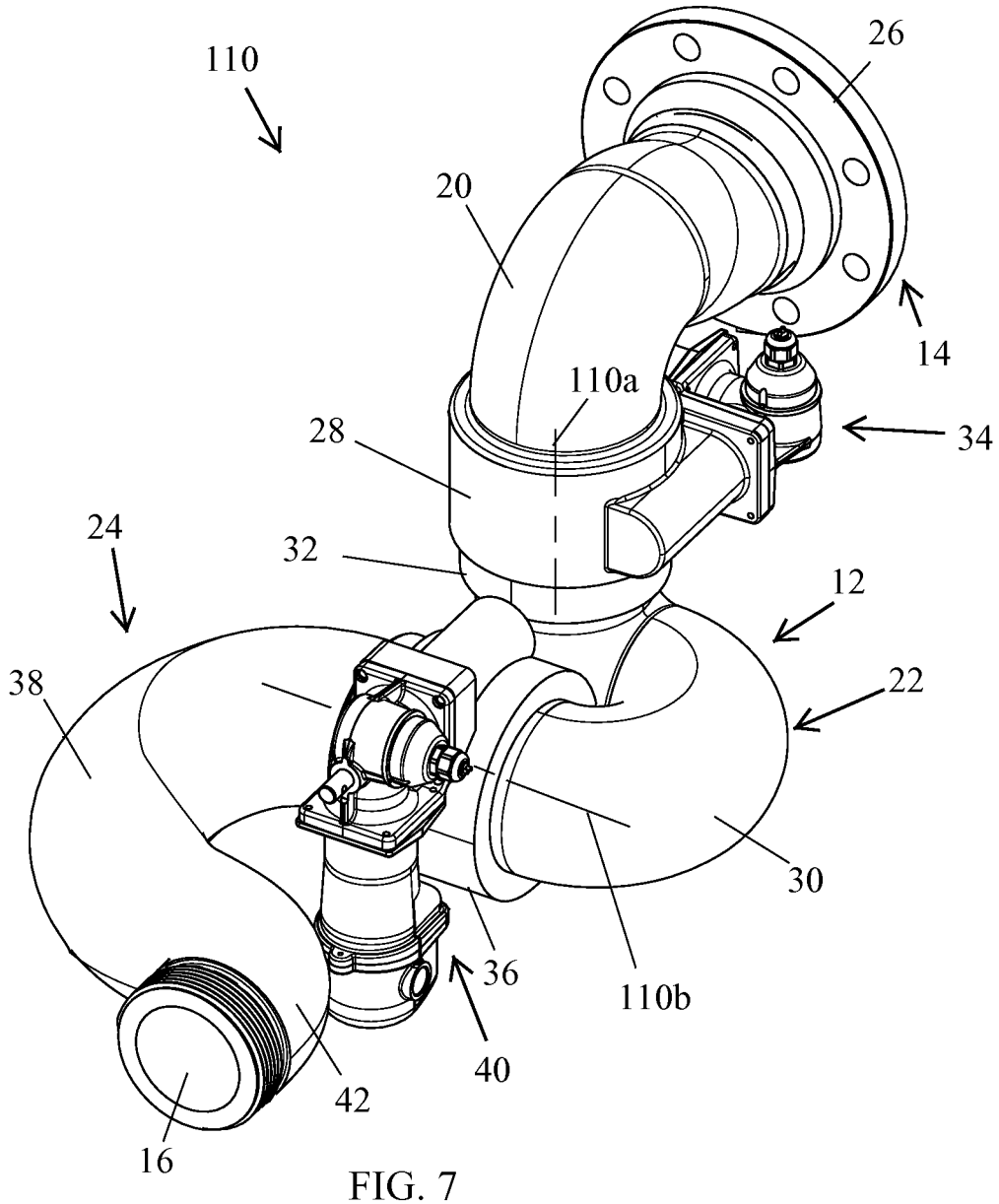


FIG. 7

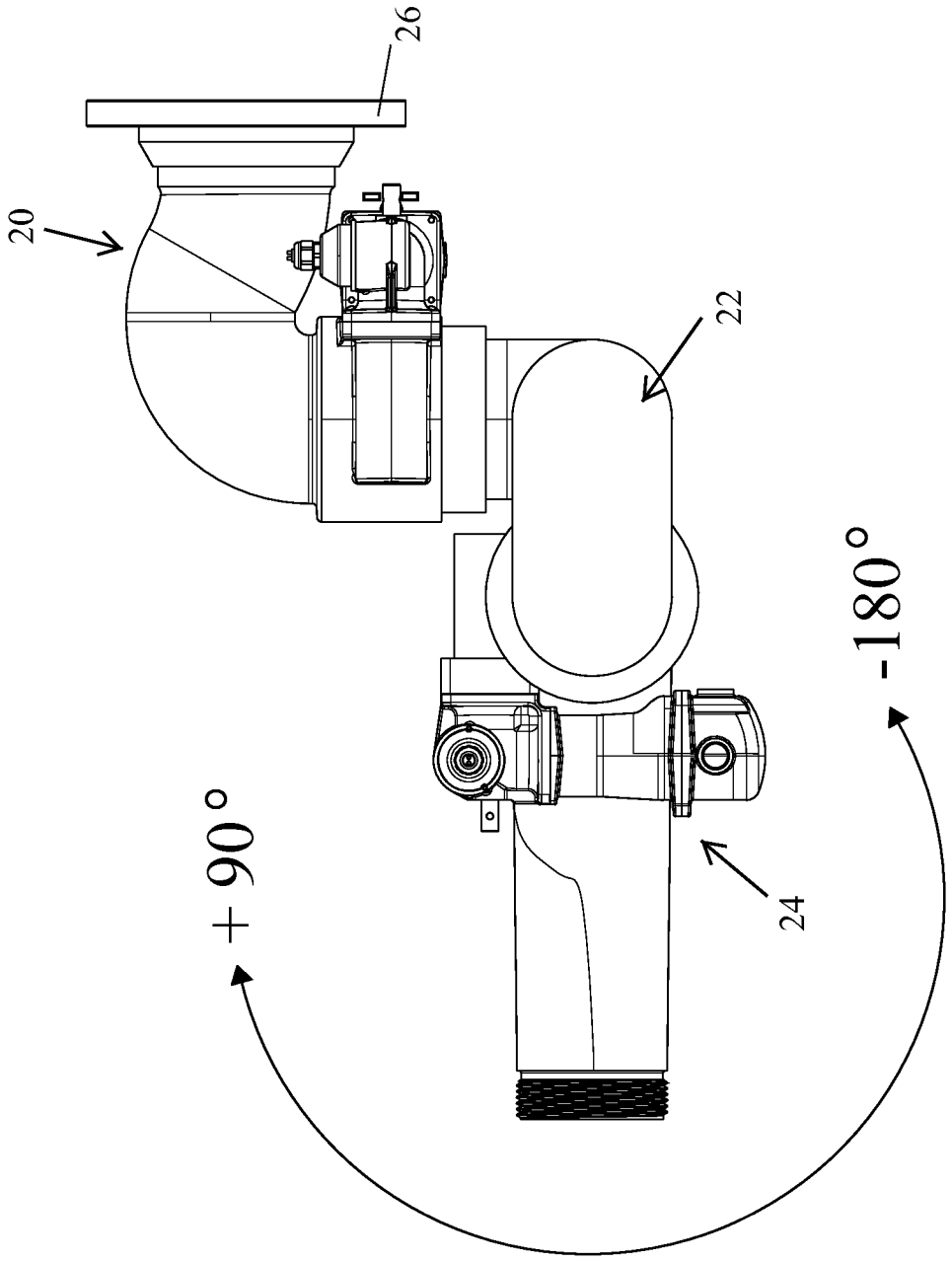


FIG. 8

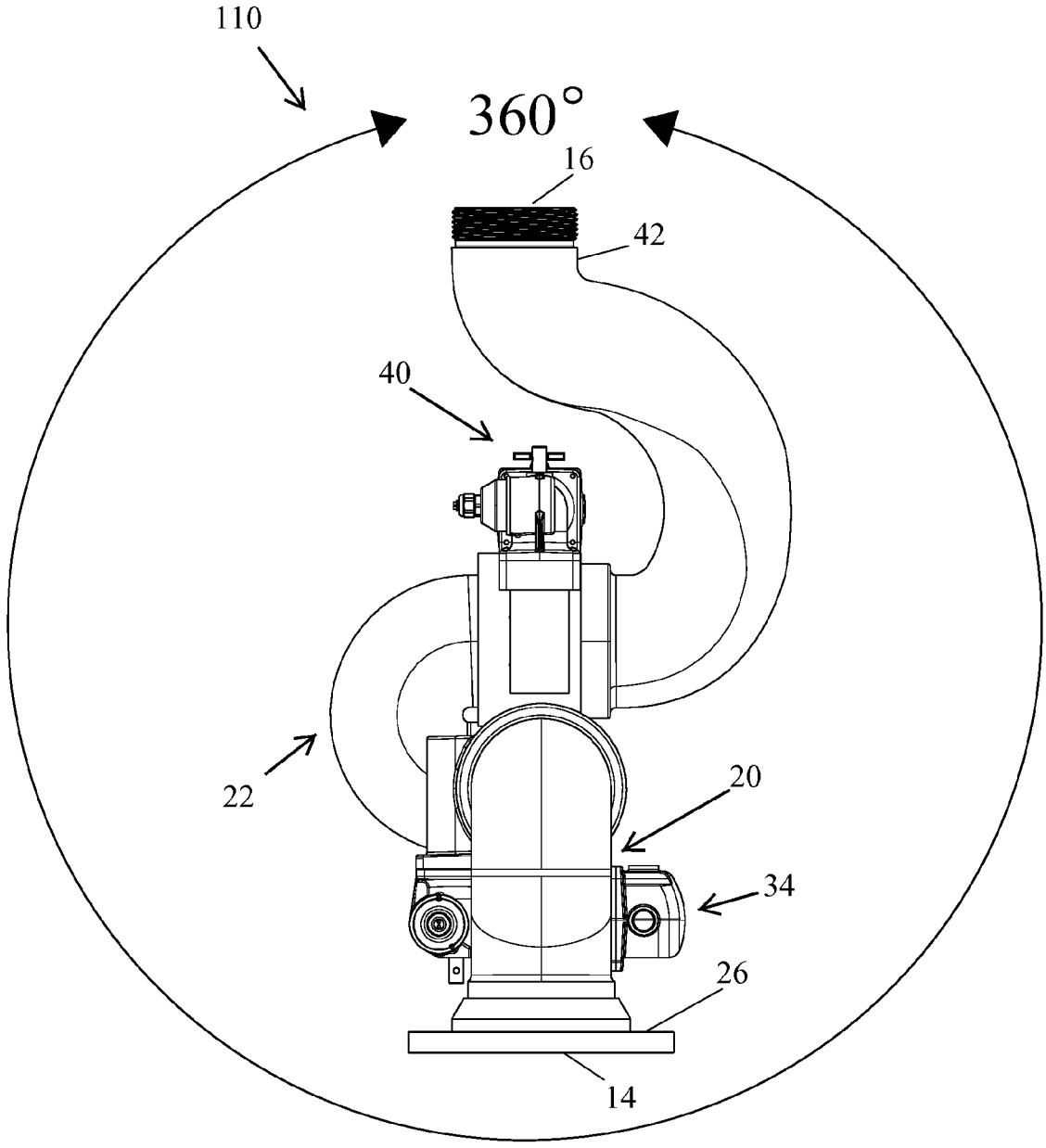


FIG. 9

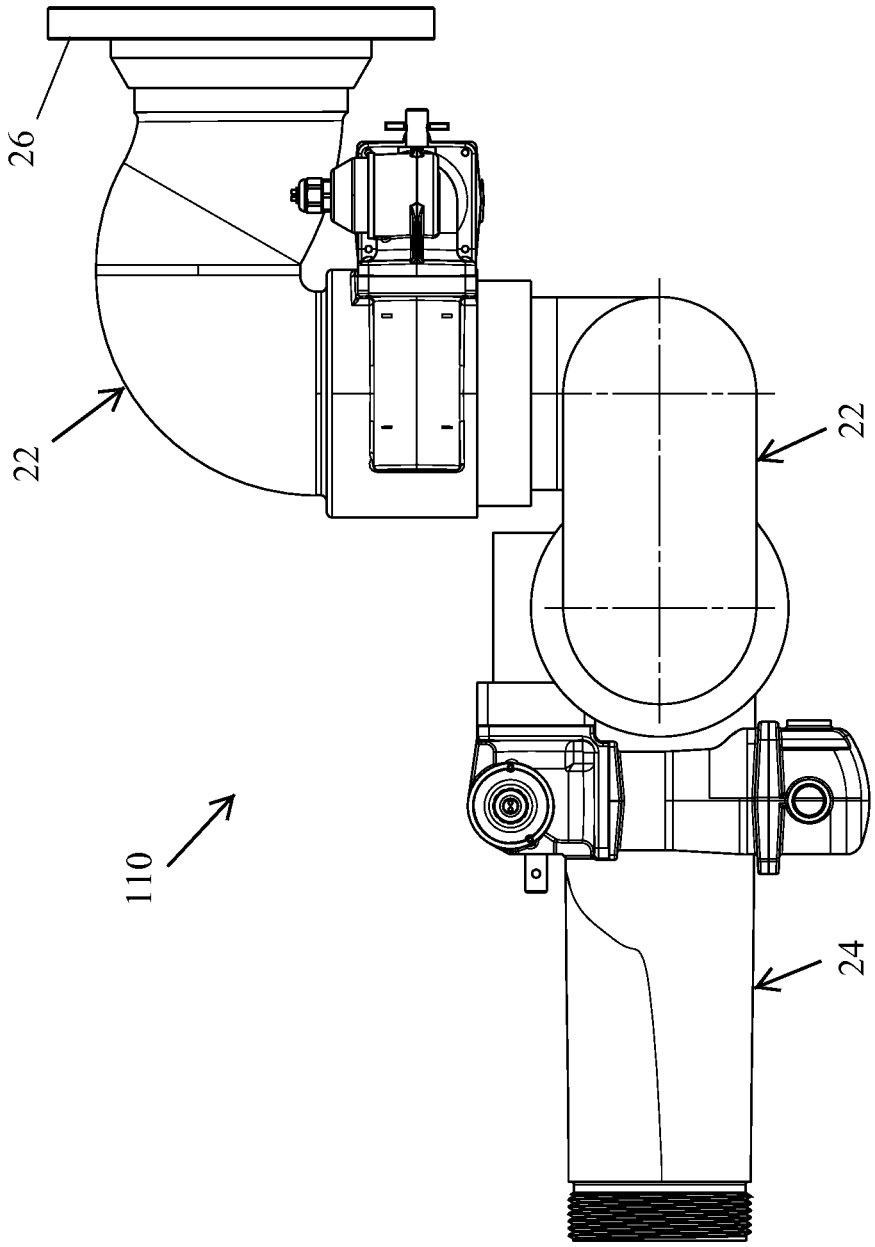


FIG. 10

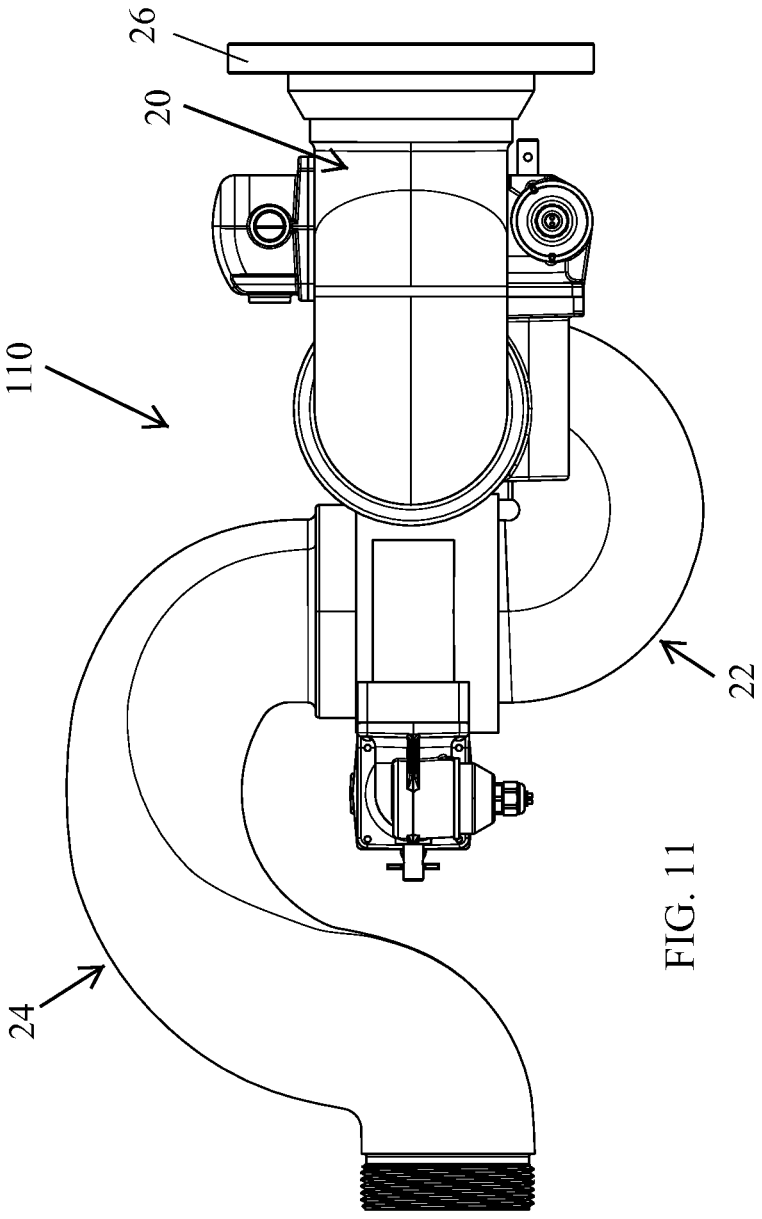


FIG. 11

FIRE FIGHTING MONITOR

TECHNICAL FIELD AND BACKGROUND OF THE INVENTION

The present invention relates to a firefighting monitor and, more specifically, to a firefighting monitor that is particularly suitable for use with fire trucks, including aircraft rescue firefighting (ARFF) trucks.

An ARFF truck is a special category of firefighting truck that is used to respond to aircraft ground emergencies. Like most fire trucks, an ARFF truck has an articulating boom with a monitor mounted to the end of the boom and also another monitor mounted at its bumper. The boom monitor is typically used to provide a water, chemical, or foam attack from a raised position above the aircraft, while the bumper monitor is typically used to provide a water, chemical, or foam attack from the under belly of the aircraft. The greater the speed of delivery of the fluids or foam, the better the outcome.

While attempts have been made to increase the size of the monitors and thereby increase the flow of the fluid or foam, with increased size typically comes increase in weight and cost to manufacture.

SUMMARY OF THE INVENTION

Accordingly, the present invention provides a monitor that can be compact in size while achieving greater flow efficiency and further a greater range of motion.

In one form of the invention, a fire-fighting monitor includes a body having a fluid passageway forming an inlet and an outlet, with the inlet being adapted to mount to a base on a fire truck, and with the body being configured so that the outlet is rotatable about a vertical axis over a 360 degree range of motion. Also, the body is configured such that the outlet is rotatable about a horizontal axis over a range of motion from about 180 degrees above horizontal to about 15 degrees below horizontal.

In another form of the invention, a fire-fighting monitor includes a body having a fluid passageway forming an inlet and an outlet, with the inlet being adapted to mount to a base on a fire truck, and with the body being configured so that the outlet is rotatable about a vertical axis over a 360 degree range of motion. The body is also configured such that the outlet is rotatable about a horizontal axis over a range of motion from about 180 degrees below horizontal to about 90 degrees above horizontal.

In yet another form of the invention, a fire-fighting monitor includes a body having a fluid passageway. The body includes an inlet pipe section forming an inlet, an intermediate pipe section, and an outlet pipe section forming an outlet, which is rotatably mounted to the intermediate pipe section about a horizontal axis. The inlet pipe section lies in a vertical plane and is adapted to mount to a base on a fire truck. The intermediate pipe section lies in a horizontal plane and is rotatably mounted to the inlet pipe section about a vertical axis. The intermediate pipe section is configured so that the intermediate pipe section and the outlet pipe section are rotatable about a vertical axis over a 360 degree range of motion. In addition, the outlet pipe section is configured to rotate relative to the intermediate pipe section about the horizontal axis between positions above and below the horizontal plane. At least one of the positions is up to 180 degrees with the outlet pipe section still clearing the intermediate pipe section such that the intermediate pipe section does not limit the rotation of the outlet pipe section.

In one aspect, the intermediate pipe section does not limit the rotation of the outlet pipe section up to about 90 degrees above horizontal. In a further aspect, the intermediate pipe section does not limit the rotation of the outlet pipe section up to about 180 degrees below horizontal.

In other aspects, the intermediate pipe section does not limit the rotation of the outlet pipe section up to about 180 degrees above horizontal. Further, the intermediate pipe section does not limit the rotation of the outlet pipe section up to about 15 degrees below horizontal.

In any of the above monitors, the monitor may include a driver for rotating the outlet about the vertical axis and/or a driver for rotating the outlet about the horizontal axis.

According to yet another form of the invention, a fire-fighting monitor includes a body having a fluid passageway, and with the body comprising an inlet pipe section forming an inlet and adaptable mount to a base on a fire truck, a 180 degree elbow intermediate pipe section rotatably mounted to the outlet of the inlet pipe section about a vertical axis, and a 180 degree elbow outlet pipe section rotatably mounted to the outlet of the intermediate pipe section about a horizontal axis and forming an outlet. The outlet pipe section has a larger radius of curvature than the intermediate pipe section wherein the outlet pipe section may rotate relative to the intermediate pipe section about the horizontal axis without interference from the intermediate pipe section.

In one aspect, the monitor further includes a driver for rotating the outlet pipe section about the horizontal axis. In addition, the outlet pipe section is sized to clear the driver when rotated about the horizontal axis.

In a further aspect, the monitor is configured as a boom monitor. In this configuration, the outlet is rotatable above horizontal up to about 90 degrees and below horizontal up to about 180 degrees.

In another aspect, the monitor is configured as a bumper monitor. In this configuration, the outlet is rotatable above horizontal up to about 180 degrees and below horizontal up to about 15 degrees.

Accordingly, the present invention provides a compact monitor while achieving greater flow efficiency and further a greater range of motion than heretofore known.

Theses and other objects, advantages, purposes, and features of the invention will become more apparent from the study of the following description taken in conjunction with the drawings.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevation of a fire truck incorporating the monitors of the present invention;

FIG. **2** is a top perspective view of a monitor of the present invention;

FIG. **3** is a side elevation view of the monitor of FIG. **2**;

FIG. **4** is a top plan view of the monitor of FIG. **2**;

FIG. **5** is an enlarged side elevation view of the monitor of FIG. **2**;

FIG. **6** is an enlarged top plan view of the of the monitor of FIG. **2**;

FIG. **7** is a top perspective view of another embodiment of monitor of the present invention;

FIG. **8** is a side elevation view of the monitor of FIG. **7**;

FIG. **9** is a top plan view of the monitor of FIG. **7**;

FIG. **10** is an enlarged side elevation view of the monitor of FIG. **7**; and

FIG. **11** is an enlarged top plan view of the monitor of FIG. **7**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. **1**, the numeral **10** generally designates a monitor of the present invention that is particularly suitable for use on an ARFF (aircraft rescue fire fighting) truck T. Truck T may have two monitors, a monitor **10** that is mounted at the bumper of the truck for directing fluid, such as water, form or other chemicals, to the underside of an aircraft, and a second monitor **110** that is mounted to the end of an articulating boom, which is used to direct fluid to the aircraft from above. As will be more fully described below, each monitor has a desired range of motion in order to achieve its fire fighting function and, further, may be assembled from common components that are reconfigured depending on whether the monitor is to be used as a bumper monitor or a boom monitor.

As best seen in FIG. **2**, monitor **10** includes a housing **12** with an inlet **14**, which is adapted to connect to a base on a fire truck that provides a supply of fire fighting fluid, such as water, foam, or the like, and an outlet **16**. In the illustrated embodiment, monitor **10** is configured as a bumper monitor for ARFF truck T; therefore, in the illustrated embodiment inlet **14** is adapted to connect to a fixed base provided at the ARFF truck bumper. As will be more fully described below, housing **12** is configured so that outlet **16** can be rotated about a vertical axis **10***a* through a horizontal travel of 360 degrees and can be rotated about a horizontal axis **10***b* through a vertical range of travel in a range of about 195 degrees, starting at about a 15 degrees position below (−15 degrees) horizontal position to about a 180 degree position above horizontal position without interfering with the housing or the drive components, more fully described below.

As best seen in FIGS. **2-4**, housing **12** is formed from a plurality of pipe sections, including an inlet pipe section **20**, an intermediate pipe section **22**, and an outlet pipe section **24**. In the illustrated embodiment, inlet pipe section **20** includes a mounting flange **26** that mounts monitor **10** to the bumper at a fixed base or supply outlet provided at the bumper. As will be more fully explained below, similar to the aerial or boom mounted monitor **110**, inlet pipe section **20** comprises a 90 degree elbow with an enlarge collar **28** at its distal end and flange **26** at its proximal end. When mounted to the bumper, inlet pipe section **20** will have a generally vertical orientation with flange **26** positioned below collar **28**.

Intermediate pipe section **22** comprises a 180 degree pipe section **30** with a 90 degree elbow **32** that inserts into collar **28** to thereby rotatably mount intermediate pipe section **22** to inlet pipe section **20** about vertical axis **10***a*. Elbow **32** is rotatably supported and sealed in collar **28** by bearings and seals, such as o-ring seals, and is mounted for 360 degree rotation in collar about axis **10***a* and, further, may be driven by a driver **34**. When mounted to inlet pipe section **20**, intermediate pipe section **22** therefore generally lies in a horizontal plane.

The distal end of intermediate pipe section **22** includes an enlarged collar **36** for rotatably receiving the proximal end of outlet pipe section **24**, which is also rotatably supported and sealed in collar **36**, for example by bearings and o-ring seals, and is supported for rotatable movement in the collar about a horizontal axis **10***b* over at least about a 195 degree range, starting at about a 15 degree position below (or −15 degrees) horizontal to a 180 degree position above horizontal. Further the distal end of pipe section **24** is threaded for mounting a nozzle therein on.

Monitor **10** also includes a second driver **40** for driving outlet pipe section **24** about horizontal axis **10***b* to thereby selectively position outlet **16** of monitor **10**. Suitable drivers for drivers **34** and **40** include wired or RF controlled drivers such as the drivers described in copending U.S. application Ser. No. 12/174,866, filed Jul. 17, 2008, entitled FIRE-FIGHTING DEVICE FEEDBACK CONTROL (ELK01 P-326A) and U.S. Pat. Nos. 7,243,864; 7,191,964; and 6,994,282, all commonly owned by Elkhart Brass Manufacturing Company, Inc., and which are incorporated by reference herein in their entireties.

In order to allow outlet **16** to pivot below horizontal, outlet pipe section **24** is configured as a 180 degree pipe section **38** with a 90 degree elbow **42** at its distal end, and with pipe section **38** sized so that it is larger than pipe section **22**. For example, its inside length A (FIG. **6**) is greater than the distance from the inside of the proximal end of outlet pipe to the outside surface of intermediate pipe (shown as dimension B in FIG. **6**) or stated in another way the distance from the centerline of the input end of the 180 degree pipe section **38** to the centerline of the outlet end of pipe section **38** is greater than the centerline to centerline dimension of the 180 degree pipe section **30** of intermediate pipe section **22**. Optionally, dimension A may be increased to clear collar **28** so that outlet **16** may have an even greater range of motion below horizontal.

For example, referring to FIG. **6**, for a monitor assembled from 4 inch diameter pipe sections, the distance from the proximal end of pipe section **38** to its outer-most point at the 180 degree bend may be about 8.6 inches, while the similar dimension for intermediate pipe section **22** may be about 7.1 inches in one preferred form. Similarly, referring to FIG. **5**, for a monitor with 4 inch diameter pipe sections, the distance from the mounting surface of flange **26** to the distal end of outlet pipe section **24**, may be appropriately 17.7 inches. The centerline to centerline distance between the inlet and the intermediate pipe may be approximately 9.2 inches. And the overall height of the monitor may then be about 18.6 inches (as measured from the bottom of flange **26** to the top of driver **40** when the outlet pipe section is at a horizontal orientation). It should be understood that these dimensions are exemplary of a compact four inch diameter pipe section monitor. Further, with this configuration it has been found that there is a reduced friction loss as compared to current monitors and also an increase greater range of motion than heretofore known.

Referring to FIGS. **7-11**, monitor **10** may be reconfigured as a boom monitor **110** wherein the outlet **16** is similarly rotatable 360 degrees about a vertical axis **110***a* and moved vertically about the horizontal axis in a range of about 180 degrees below (−180 degrees) horizontal to about 90 degrees above horizontal. In the boom monitor configuration, inlet pipe section **20** is oriented so that its inlet is above its outlet and further such that its outlet is reoriented 180 degrees about its horizontal axis from its orientation in monitor **10**.

Intermediate pipe section **22** in monitor **110** has the same horizontal arrangement (or mirror image horizontal arrangement) as it does on monitor **10** but is beneath pipe section **20** and also is mounted for 360 degree rotation about vertical axis **110***a* of monitor **110**. Outlet pipe section **24**, on the other hand, may be pivotally mounted for a greater forward rotation than it is in monitor **10**, for example, 180 degrees below horizontal (−180 degrees) and a smaller rearward rotation, for example to 90 degrees above the horizontal.

Again, similar to monitor **10**, monitor **110** has a compact arrangement. For example, referring to FIG. **10**, for a monitor assembled from 4 inch diameter pipe sections, the overall height of the monitor (with the outlet in the horizontal orientation) may be about 18.6 inches with an overall maximum

width of about 27.7 inches. Similarly, the overall length (as seen in FIG. **11**) may be about 15.7 inches (similar to monitor **10**). Further, the centerline from the inlet to the centerline of the intermediate pipe (and the outlet when the outlet is in the horizontal orientation) may be about 9.2 inches. The dimension from the mounting surface of flange **26** to the centerline of the outlet of intermediate pipe **22** may be about 14 inches. As best seen in FIG. **10**, monitor **110** may be sized or dimensioned such that the distance from the centerline of inlet **14** is about 8.4 inches to the outermost point of outlet pipe (at its 180 degree bend). The dimension from the centerline of the inlet **14** to the outermost point of intermediate pipe (at its 180 degree bend) may be about 7.1 inches. Again, these dimensions are exemplary of one compact configuration of a 4 inch pipe boom monitor of the present invention.

In this manner, in either configuration of the monitor, i.e. boom or bumper arrangement, outlet **16** has a range of motion that allows the monitor to provide a greater range than prior art monitors whether it is from above or below the aircraft than heretofore known. In addition, with the present configuration, the size of the pipe sections may be increased or decreased to provide a greater range of motion while still optionally maintaining the overall dimensions of a conventional monitor.

It should be understood that although one example of a pipe size section is provided, the concept of this invention may be used with other size pipe sections.

While several forms of the invention have been shown and described, other forms will now be apparent to those skilled in the art. Therefore, it will be understood that the embodiments shown in the drawings and described above are merely for illustrative purposes, and are not intended to limit the scope of the invention which is defined by the claims which follow as interpreted under the principles of patent law including the doctrine of equivalents.

We claim:

1. A fire-fighting monitor comprising:

a body having a fluid passageway and forming an inlet and an outlet;

said inlet being adapted to mount to a base on a fire truck;

said body being configured so that said outlet is rotatable about a vertical axis over a 360 degree range of motion, and said body being configured so that in a first mounted orientation, said outlet is rotatable about a horizontal axis over one range of motion from about 180 degrees above horizontal to about 15 degrees below horizontal, and said body being configured so that, in a second mounted orientation, said outlet is rotatable about the horizontal axis over another range of motion from about 180 degrees below horizontal to about 90 degrees above horizontal, wherein:

said inlet comprising an inlet pipe section and being adapted to mount to the base on the fire truck, said body further comprising a first 180 degree elbow intermediate pipe section rotatably mounted to an outlet end of the inlet pipe section about the vertical axis, and a second 180 degree elbow outlet pipe section rotatably mounted to an outlet end of the intermediate pipe section about the horizontal axis, said second 180 degree elbow forming said outlet, and

said outlet pipe section having a larger radius of curvature than said intermediate pipe section wherein said outlet pipe section may rotate relative to said intermediate pipe section about the horizontal axis without interference from said intermediate pipe section.

2. The monitor according to claim **1**, further comprising a first driver for rotating said outlet about the vertical axis.

3. The monitor according to claim **2**, further comprising a second driver for rotating said outlet about the horizontal axis.

4. The monitor according to claim **1**, further comprising a driver for rotating said outlet pipe section about the horizontal axis.

5. The monitor according to claim **4**, wherein said outlet pipe section is sized to clear said driver when rotated about the horizontal axis.

6. The monitor according to claim **1**, wherein said monitor comprises a boom monitor.

7. The monitor according to claim **1**, wherein said monitor comprises a bumper monitor.

* * * * *